Regeneration, Culture and Environment Overview and Scrutiny Committee

BRIEFING NOTE – No. 06/21

Date: 21 September 2021

Briefing note to: All Members of the Regeneration, Culture and Environment Overview & Scrutiny Committee.

Purpose: To advise the Committee on Medway Council's Highways Lifecycle Planning Report.

Background

This briefing note summarises Medway Council's second reporting cycle of Highways Lifecycle Planning. Lifecycle Planning plays an important role in supporting the delivery of the Highway Service, as well as achieving several key critical benefits, which consist of the following:

- It forms a key part of Medway's evidence base towards the annual Department for Transport (DfT) Self-Assessment return, therefore helping to secure maximum Incentive Funding allocation;
- It improves Highway Service delivery though performance target setting, and it helps to maximise returns from current investment levels;
- It supports Highway Network investment decisions through Medway Council's budget setting process, underpinned by the Medium-Term Financial Strategy and Capital Strategy;
- It helps to achieve external funding acquisitions, such as Prudential Borrowing or future Challenge Funding bids.

Lifecycle Planning

Lifecycle Planning incorporates information relating to Highway Asset inventory, condition and performance data. It identifies both the short-term routine maintenance needs and longer-term capital investment necessary to deliver against specific performance targets, whilst also supporting strategic level planning for future highway investment.

Lifecycle Planning uses a combination of Medway Council's Capital and Revenue Highway investment budgets, which are identifiable against key highway asset groups. The identified levels of investment are those deemed to improve the

condition of the asset, therefore staffing, cyclical maintenance, or mechanical and electrical budgets are excluded from lifecycle modelling.

All Local Highway Authorities that partake in the DfT Self-Assessment Incentive Fund Scheme are required to produce Lifecycle Planning Reports, in order to demonstrate adoption of Highway Asset Management Principles.

This is Medway Council's second cycle of Lifecycle Planning, which aligns with the Council's annual Medium-Term Financial Strategy and Capital Strategy. The full Lifecycle Planning report is attached as **Appendix 1** to this briefing note.

Lifecycle Planning HMEP Toolkit

Lifecycle Planning uses nationally adopted toolkits to model against key asset groups. This typically consists of the Highways Maintenance Efficiency Programme (HMEP) Toolkit, which provides Authorities with planning level decision support in the maintenance management of highway assets.

The HMEP Toolkit provides added value for Medway Council, which is achieved through using deterioration models to make strategic level planning decisions by:

- Assessing the impacts that different levels of funding can make on future asset performance and asset maintenance requirements;
- Investigate the current and future levels of funding required to achieve defined levels of service and condition.

Lifecycle Planning Options

The available Lifecycle Planning options for the ongoing maintenance of highway assets can be broken down into the following modelling scenarios:

- **Steady-State Condition Performance**: This identifies the investment levels required to sustain highway assets in their current condition. This would neither improve nor worsen the condition performance of the asset group, therefore maintaining an overall 'steady-state'.

- **Investment Backlog**: This identifies the levels of highway investment required to achieve a specified condition performance. Condition performance is typically benchmarked against the National Average performance, where possible. This lifecycle option doesn't achieve perfect asset condition and instead only urgent maintenance is undertaken.

- **Asset Design Life**: This identifies the period of time that an asset should last before renewal or major refurbishment should take place. This is based on the total cost to renew the entire asset group within a specified design life period.

Lifecycle Planning Key Outcomes

Medway's Lifecycle Planning indicates that the highway asset groups requiring immediate investment are Carriageways, Crash Barriers and Drainage Gullies. The remaining highway asset groups instead have investment shortfalls over the medium to long-term. A summarisation of each of the key highway asset groups are as follows;

Carriageways: Medway's Principal and Non-Principal roads are performing better than National Average performance by 1%. In addition, Medway's Unclassified roads have improved by 3% in condition since 2018/19, however they are still 4% behind National Average performance levels. See **Appendix 2** for review of Medway's Unclassified Road Network performance. To address the performance backlog towards Medway's Unclassified roads, an additional annual investment of £2.15 million is required over a 10-year period.

Vehicle Restraint Systems (Crash Barriers): A crash barrier survey was completed on Medway's Network in 2020/21, with this identifying 23% of the total Crash Barrier as requiring maintenance. In order to undertake immediate safety repairs identified, an additional £350,000 was requested through Medway's Capital Strategy for 2022/23 and 2023/24. Then on after, an additional annual investment of £70,000 over base budget is required across an 8-year period.

Drainage (Gullies): Medway's Highway Gullies have good inventory and condition data, which is recorded within a specialised drainage asset management system**.** Lifecycle modelling hasn't been completed against other drainage assets due to limited inventory and condition data, which is commonly the case with many Highway Authorities. An additional annual investment of £95,000 is required over a 10-year period to improve gully performance, however this investment gap will likely increase once additional drainage assets have been included in future lifecycle modelling.

Footways: The good condition performance of Medway's Footway Network is a consequence of the increased base budget, which has also strengthened active travel. Only 3.4% of Medway's Footway Network has been identified as requiring maintenance, however to maintain condition performance above 5% an additional annual investment of £310,000 is required over a 9-year period from 2023/24.

Highway Structures: Currently no highway structures have been identified as being in 'Very Poor' condition. In addition, Medway's Green Street Footbridge project has been successfully completed, which will reflect positively in future condition reporting. Due to structures having a long design lifespan, current budget provision is sufficient in maintaining performance for the short-term, however over the medium to long-term an additional annual investment of £360,000 is required over a 7-year period commencing from 2025/26.

Street Lighting (Lamp Columns): Medway Council has made considerable improvements towards the condition of its Street Lighting due to one-off capital investments. This has seen the replacement of over 1,900 lamp columns as part of Prudential Borrowing, and a further 4,600 lamp columns are due to be replaced as part of the Street Lighting LED Scheme by Summer 2022. This investment has sufficiently improved performance for the short-term, however over the medium to long-term an additional annual investment of £410,000 is required over a 7-year period commencing from 2025/26.

Lifecycle Planning Summary

As a consequence of the targeted investments made within Medway Council's first Lifecycle Planning report, there has been a positive reduction in the total forecasted highway investment gap. The following **Table 1** shows that the investment gap has reduced from a total investment backlog of £43,630,000 as identified with Medway's first Lifecycle Planning report in 2017/18, to a revised total of £31,890,000 in Medway's 2020/21 Lifecycle Planning.

Key Highway Asset Group	Total Investment Backlog (2017/18 Lifecycle)	Total Investment Backlog (2020/21 Lifecycle)
	(£'000)	(£'000)
Carriageways	19,000	21,500
Crash Barrier	-	1,260
Drainage (Gullies)	-	950
Footways	3,210	2,790
Structures	12,000	2,520
Street Lighting	9,420	2,870
Total	**43,630**	**31,890**

Table 1 – Lifecycle Planning Highway Investment Shortfall Comparison.

Medway Council is not in a unique position in regards to the levels of Highway Network Investment required to maintain technical performance. Each year the Asphalt Industry Alliance commissions an independent survey (Annual Local Authority Road Maintenance Survey) of Local Highway Authorities in England and Wales. The survey estimates that it would take 10 years to get local roads back into a reasonable steady state of maintenance, if adequate funding and resources were in place, this is with the one-time catch-up cost being an average of £77.2 million per Authority in England.

Highway Investment Challenges

The Governments Spending Review in November 2020 prioritised the response to Covid-19, which focused on supporting jobs and families. The Spending Review committed £1.125 billion of local roads maintenance funding in 2021-22,

which includes the Potholes Fund, to fix potholes and resurface roads. This is supported by a further £260 million within the Integrated Transport Block (ITB), which includes public transport and active travel upgrades.

Following the Governments spending review, Medway Council's DfT funding allocations for Highway Maintenance is set to reduce by circa £1,210,000 from 2021/22 onwards, as **Table 2** below shows. There are no indications that funding will increase, and it is expected that more emphasis will be made towards the adoption of more asset management principles in future, in order to secure DfT funding through the Self-Assessment Incentive Fund process.

Medway Funding Allocation	Potholes Fund	Highways Maintenance Block		Integrated Transport Block	Total
		Needs Element	Incentive Element		
	(£'000)	(£'000)	(£'000)	(£'000)	(£'000)
2020/21	1,925	2,048	427	1,589	**5,989**
2021/22	1,412	1,412	353	1,602	**4,779**
Variance	-513	-636	-74	+13	**-1,210**

Table 2 – DfT Funding Allocations for Medway Council.

This funding reduction will incur competing pressures on Council Spending Priorities and is consequentially reflected within Medway Council's Medium-Term Financial Strategy.

The DfT funding allocations detailed above however do not include the Medway Tunnel DfT Challenge Fund Bid, for which a separate capital grant was awarded to Medway Council in 2020 of £4.9 million. This capital grant will be used towards the maintenance of critical components of the Medway Tunnel and surrounding supporting infrastructure.

In addition, Medway Council's Street Lighting LED Replacement Scheme, which is due for completion by Summer 2022, has a total budget of approximately £11 million. As a result of Medway's first Lifecycle Planning report, capital funding (Prudential Borrowing) was also secured, which enabled a programme of Street Lighting Column Replacements to be undertaken in 2018/19 and 2019/20.

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Appendices

Appendix 1 – Medway Council's Highways Lifecycle Planning (2020/21).

Appendix 2 – Unclassified Road Network Condition Performance.

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Highways Lifecycle Planning

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Change Control

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Author	Jonathan Abel
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Reviewer List

Name	Role	Versions		
		2018	2021	2025
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Approvals

Name	Role	Date	Version
Simon Swift	Head of Highways and Parking	19/6/2018	First Issue
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First Issue	June 2018	First Issue	NM
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Contents

1 Introduction

1.1 Context

The Department for Transport (DfT) places the National Highway Network asset value at over £400 billion and HM Treasury's National Infrastructure Strategy states that 'high quality local roads are central to the future of transport, playing an important role in the take-up of autonomous vehicles and greener forms of transport.' Medway's Highway Network Infrastructure is estimated to have a total replacement cost of over £2 Billion, making it one of Medway Council's most valuable publicly owned assets.

Local Highway Authorities in England and Wales are facing significant challenges for the ongoing maintenance of their highway infrastructure due to growing pressures and limited resources. Findings publicised within the Alarm Survey conducted by the Asphalt Industry Alliance (AIA) identified that Great Britain's traffic volumes have increased by over 50 billion vehicle miles a year, almost 17 percent between 2010 and 2019. Highway Authorities have estimated that it would take 10 years to get local roads back into a reasonable steady state of maintenance, if adequate funding and resources were in place, this is with the one-time catch-up cost being an average of £77.2 million per Authority in England.

The funding allocated to each highway authority in England during 2020/21 was based on a formula using 2019 road length data provided by each local highway authority, and also takes into account the number of highway assets such as bridges and lighting columns. A breakdown of the Department for Transport funding allocations during 2020/21 can be seen in within **Table 1.0** below, with capital and revenue highway budgets in 2020/21 being used as the basis towards this lifecycle planning report.

Funding Allocation	Potholes Fund	Highways Maintenance Block		Integrated Transport Block	Total
		Needs Element	Incentive Element		
	(£'000)	(£'000)	(£'000)	(£'000)	(£'000)
England	649,998	725,000	150,368	257,998	1,783,364
South East	108,576	119,905	24,974	47,251	300,706
Medway	1,925	2,048	427	1,589	5,989

Table 1.0 – Department for Transport Funding Allocations during 2020/21.

The National Infrastructure Strategy, launched in November 2020, underlines how 'well maintained local roads allow for faster and reliable journeys, boosting local businesses and serving all road users.' As highlighted in the Strategy, the Spending Review committed to £1.125 billion local roads maintenance funding in 2021-22, which includes £500 million Potholes Fund, to prevent potholes and resurface roads. This is supported by a further £260 million within the Integrated Transport Block (ITB), which includes public transport and active travel upgrades. During February 2021 the DfT confirmed that the highways maintenance incentive element questionnaire for relevant highway authorities commenced for 2021/22, whereby the incentive element will be worth 20% of the £625 million total Highways Maintenance Block (HMB) funding.

2 Executive Summary

Lifecycle Planning is a key function which supports the delivery of Medway Council's Highways Asset Management Plan, and forms part of the evidence base towards Medway's annual DfT Incentive Fund Self-Assessment return.

The purpose behind Lifecycle Planning is to link financial plans with network condition and performance data in order to establish whether current highway budget provision will improve or worsen the highway network condition over the medium to long-term. This lifecycle modelling is completed against key highway asset groups, and the report findings can be summarised as follows:

2.1.1 Carriageways

There is a good condition performance towards Medway's carriageway network, with the Principal and Non-Principal Road Networks performing better than National Average by 1%. Medway's Unclassified Network has also improved by 3% in condition performance since 2018/19, however this is still behind the National Average performance by 4%.

In order to align Medway Council's Carriageway Network with the performance targets identified within the lifecycle modelling, and sequentially improve the performance of Medway Unclassified Road Network to align with the National Average, an additional annual investment of £2.15 million is required over a 10-year period.

2.1.2 Footways

Medway Council's Footway Network totals 1,059km, of which 3.4% of this has been identified as requiring maintenance. Recent improvements have been made towards the Footway Network Survey, which utilise a red/amber/green condition reporting format that aligns closely with the condition reporting used for carriageways.

The good condition performance of footways means no additional funding is required over the short-term. In order to maintain footway condition performance above 5% condition performance, Lifecycle Modelling has identified an additional investment of £310,000 being required from 2023/24, over a 9-year period.

2.1.3 Highway Structures

This Lifecycle focuses on Highway Structures only and excludes Medway Tunnel. This is due to the £4.9 million Medway Tunnel Challenge Fund bid award, which would otherwise distort lifecycle modelling. The Green Street Footbridge project was successfully completed, which in will reflect positively in future condition performance reporting.

No structures have been identified as being in 'Very Poor' condition, and current budget provision is therefore sufficient in maintaining performance for the short-term. However over the medium to long-term an additional annual investment of £360,000 is required over a 7-year period commencing from 2025/26.

2.1.4 Street Lighting (Lamp Columns)

Medway Council has made considerable improvements towards the condition of its Street Lighting assets due to one-off capital investments. This has seen the replacement of over 1,900 lamp columns as part of Prudential Borrowing, and a further 4,600 lamp columns are due to be replaced as part of the Street Lighting LED Scheme by 2022.

The positive performance from capital investment means no additional funding is required in the short-term. In order to maintain the performance benefits achieved from these capital investments, Lifecycle Modelling has identified an additional investment of £410,000 being required from 2025/26, upon completion of the Street Lighting LED Scheme.

2.1.5 Highway Drainage (Gullies)

Lifecycle modelling has been completed against the Gully Asset only, due to this asset group containing accurate inventory and condition data within Medway's specialised drainage asset management system. Cyclical drainage budgets haven't been included within lifecycle budget modelling, and from measuring performance data against current budget provision, Lifecycle Modelling predicts an annual budget shortfall of £95,000 over the next 10-years.

Lacking drainage inventory and condition data is commonly the scenario with many Local Highway Authorities, due to the cost of surveying the next being extensive. Once more drainage assets are included in future lifecycle modelling, the drainage investment gap will likely increase within the next lifecycle reporting cycle.

2.1.6 Vehicle Restraint Systems (Crash Barriers)

A crash barrier condition survey was completed on Medway's highway network in 2020/21, with the survey identifying 23% of Medway's total Crash Barrier Asset as being in poor condition. Historically, as crash barrier hasn't received direct investment an additional £350,000 was requested through Medway's Capital Strategy for 2022/23 and 2023/24. Thereafter, lifecycle modelling has identified an annual budget shortfall of £70,000 to ensure that crash barrier is replaced within is expected design life of 50 years.

2.1.7 Lifecycle Planning Budget Forecasting

The lifecycle budget modelling across all of the key highway asset groups have been included within **Table 2.0** below. The total highway maintenance investment backlog identified as part of the first 2017/18 Lifecycle Planning report was £43,630,000 over a 10-year period. Since making improvements towards the condition performance of highway assets as a consequence of focused investment identified within Medway's Lifecycle modelling, the total highway investment backlog identified as part of the 2020/21 Lifecycle Planning report is now £31,890,000 over a 10-year period.

Investment Period		Carriageways (2020/21)	Crash Barrier (2020/21)	Drainage (Gully) (2020/21)	Footways (2020/21)	Structures (2020/21)	Street Lighting (2020/21)	Total
		(£'000)	(£'000)	(£'000)	(£'000)	(£'000)	(£'000)	(£'000)
Base Budget Provision		**2,085**	**120**	**75**	**840**	**390**	**540**	**4,050**
Annual Breakdown of Investment Backlog	Year 1 – (2022/23)	2,150	350	95				**2,595**
	Year 2 – (2023/24)	2,150	350	95	310			**2,905**
	Year 3 – (2024/25)	2,150	70	95	310			**2,625**
	Year 4 – (2025/26)	2,150	70	95	310	360	410	**3,395**
	Year 5 – (2026/27)	2,150	70	95	310	360	410	**3,395**
	Year 6 – (2027/28)	2,150	70	95	310	360	410	**3,395**
	Year 7 – (2028/29)	2,150	70	95	310	360	410	**3,395**
	Year 8 – (2029/30)	2,150	70	95	310	360	410	**3,395**
	Year 9 – (2030/31)	2,150	70	95	310	360	410	**3,395**
	Year 10 – (2031/32)	2,150	70	95	310	360	410	**3,395**
Total Investment Backlog		**21,500**	**1,260**	**950**	**2,790**	**2,520**	**2,870**	**31,890**
Total Investment Required		**42,350**	**2,460**	**1,700**	**11,190**	**6,420**	**8,270**	**72,390**

Table 2.0 – Lifecycle Planning Budget Shortfall Identification 2020/21.

3 Developing the Lifecycle Models

3.1 Highways Maintenance Efficiency Programme (HMEP) Lifecycle Toolkit

HMEP is a sector-led transformation initiative aiming to maximise returns from investment and deliver efficiencies in Highway Maintenance Services. With sponsorship from the Department for Transport, HMEP have developed Lifecycle Modelling Toolkits which are intended to be used by Local Highway Authorities to support strategic level planning decisions such as:

- Assessing the budget impact on asset performance and future maintenance needs;
- Investigating the funding levels required to achieve a specified asset condition;
- To aid the process of setting performance targets against key highway assets;
- Striving to reduce whole life costs by means of timely interventions.

Common terminologies used as part of the Lifecycle Modelling consist of the following:

- Backlog – The investment required to attain a desired condition, however not perfect condition, which typically means only urgent maintenance is undertaken;
- Steady State – Investment required to sustain the asset in its current condition level;
- Design Life – The period of time the asset should last before renewal or major refurbishment should take place.

To develop an effective Lifecycle Plan for each of the identified key highway asset groups, the following parameters must be entered into the Toolkit Model:

- Highway Asset Data, consisting of asset sizes, quantities, and condition data;
- Lifecycle Transition Matrix, the industry standard design life for each highway asset, with the probability that any portion of the network in a certain condition will deteriorate to a lower condition from one year to the next;
- Treatment Effects and Costs, the costs and effects of each treatment type available, some treatment types might be cheaper but will not last as long;
- Treatment Strategies, the ratios of different treatment types chosen for the network, allowing for both reactive and preventative maintenance;
- Budgets, the anticipated long-term funding levels for each Key Highway Asset Group;
- Highway Service Key Performance Targets.

The overarching objective of Lifecycle Planning is to therefore develop long-term plans to effectively manage Key Highway Assets throughout their lifespan. An assets lifecycle includes the entire span of time a Local Highway Authority manages that asset, from initial construction or adoption to the end of its service life.

By developing a Lifecycle Plan for each key Highway Asset Group, Medway Council has the ability to determine when and how maintenance should take place and the subsequent levels of investment required to keep its public assets safe and in a serviceable condition. The outputs of the lifecycle modelling are also used to inform Medway Council's Medium-Term Financial Strategy and Capital Strategy. Three versions of the HMEP Toolkit are available, consisting of the following:

- Carriageway Toolkit – This is aimed at providing Highway Authorities with planning level decision support in the maintenance management of carriageways;
- Footway Toolkit – This is aimed at providing Highway Authorities with planning level decision support for the management of footways and dedicated cycleways;
- Ancillary Toolkit - Provides flexibility around deterioration modelling and can therefore be used across a range of other key highway asset groups. This model has been adopted for Medway's Street Lighting (Lamp Column) Lifecycle.

3.2 Markov Drainage System Toolkit

Medway Council's Highway Drainage Asset Group has been modelled using the 'Markov model' Toolkit, which provides a method of forecasting the lifecycle investment for typical assets that make up a drainage system. The model uses a Markov renewal process and relies on the following information to provide effective lifecycle modelling:

- Total number or length of drainage assets;
- The rate of transition between each drainage asset condition grade;
- The unit costs, and intervention costs to improve drainage condition grades;
- The current drainage condition grade profiles.

3.3 Structures Asset Valuation and Investment (SAVI) Toolkit

The SAVI model was developed for the UK Bridges Board to assist Local Highway Authorities with the management of their structure stock, and to ensure that there is an accessible and consistent national approach towards Highway Structures.

The SAVI model provides a multi-functional, condition-based decision support tool, which can be used to carry out valuation of structures stock, develop prioritised short-term programmes of work, and long-term asset management plans. Some of the key features behind the SAVI model include:

- Long-term asset management plans can be developed to determine intervention strategies;
- To model variable budget scenarios against performance and whole life cost;
- Developing tactical short-term programmes of work and to carry out both gross and depreciated valuation of structures stock;
- Providing a range of outputs to support business case development, funding applications, short-term and long-term asset management plans;

3.4 Medway's Lifecycle Planning Inputs

3.4.1 Key Highway Asset Groups (Asset Inventory)

The following **Table 3.0** shows a breakdown of the highway inventory data for 2020/21, which was extracted from Medway Council's Asset Management System. The table shows the scope of the highway assets under management, all of which require maintenance with an expected service life and an eventual replacement requirement. This forms the inventory basis of this Lifecycle Planning Report.

Asset Group	Classification/Highway Asset Types	Extent
Carriageways (827 km)	A Class Road B Class Road C Class Road Unclassified Road	102 km 32 km 85 km 608 km
Footways (1,059 km)	Bituminous Block Paved Concrete Flagged Other Surface	989 km 11 km 15 km 30 km 14 km
Structures (183 no.)	Bridges (Including Footbridges) Retaining Wall Culvert Sign / Signal Gantry Tunnels and Underpasses Other	52 no. 95 no. 12 no. 5 no. 10 no. 9 no.
Street Lighting (26,310 columns)	Belisha Beacon Feeder Pillar Flector Bollard Illuminated Bollard Illuminated Sign Refuge Island Indicator School Flasher Lamp Column Subway Fitting	105 no. 173 no. 39 no. 1,297 no. 1,892 no. 255 no. 32 no. 26,310 no. 121 no.
Drainage (35,571 gullies)	Pipe Gully Manhole/Catchpit Ditches and Grips Linear Drainage Outfalls, Soakaways and SuDS Flap Valves Interceptors	226 km 35,571 no. 5,442 no. 164 km 5 km 288 no. 109 no. 3 no.
Vehicle Restraint Systems (29 km crash barrier)	Crash Barrier	29 km

Table 3.0 – Medway's Highway Asset Inventory in 2020/21.

3.4.2 Key Highway Asset Condition Data

For Medway Council to maintain the Highway Network to a suitable operating level and a safe standard in accordance with the Highways Act (1980), a number of Condition Indices have been developed for each Highway Asset Group. This Condition Data can be used for:

- Providing information about asset condition for internal and external publication;
- Generating a rolling annual programme of maintenance schemes;
- Providing data in an industry standard format allowing for National comparisons;

- Effective targeting of maintenance spends which is essential to maximise return on investment through Lifecycle Modelling;
- Supporting investment decisions through the Council's annual budget setting process to identifying where maintenance is most needed;
- Supporting funding bids to the DfT for highway investment.

The following **Table 3.1** shows a breakdown of the highway condition data for 2020/21, which has partly sourced from Medway Council's Asset Management System as well as from Highway Survey data, where applicable.

Asset Group	Performance Detail	Highway Asset Sub-Category	Performance (2017/18)	Performance (2020/21)
Carriageways (Principal and Non-Principal Roads)	National Indicators NI130-01 & NI130-02, BVPI224b. The percentage of carriageways requiring maintenance.	A Class Road B Class Road C Class Road Unclassified Road	2% 5% 4% 20%	2% 3% 5% 20%
Footways	Lifecycle Modelling based on Footway Condition Surveys. The percentage of footways requiring maintenance.	Bituminous Block Paved Concrete Flagged Other	4% 1% 6% 4% -	4% 0% 1% 2% 2%
Structures	Bridge Condition Index (Average) below 70%. Bridge Condition Index - Minimum 70% before safety measures and weight restrictions apply	Retaining Wall Culvert Sign Gantry Pedestrian Subway Footbridge Tunnel Bridges Misc Structures	84.1% 87.5% 96.1% 81.1% 82.8% 78.0% 86.6% 85.5%	95.2% 100% 100% 100% 100% 100% 95.7% 100%
Street Lighting	Based on assumed age data and split into condition bandings against Street Light Column material design life.	Street Light Columns to be replaced	3,171	8,159
Drainage	Condition made on number of gullies in operation and number of gullies needing repairs per annum, based on network cyclical maintenance survey data.	Gullies Not Operating Properly	16%	9.5%
Vehicle Restraint Systems	Based on part of the highway crash barrier condition survey, which is extrapolated to capture the full barrier asset.	Crash Barrier identified as being in 'Low' condition	No data available	23.3%

Table 3.1 – Medway's Performance Indicators for Maintenance Backlog in 2020/21.

3.4.3 Highway Condition Influencing Factors

Ideally the Highway Network should be maintained in as good condition as possible. It is important to recognise however that the condition of highway assets can be affected under a number of varying factors, which all contribute to the overall deterioration of a highway asset over time. Some of these contributing factors include:

- Natural deterioration through oxidation, particularly in materials with high-void content. This occurs more often at high temperatures and under direct sunlight;
- High temperatures can also increase the likelihood of cracking or deformation;
- Low temperatures can create a freezing/thawing effect on materials, particularly in areas of standing water. This can lead to expansion and resulting material failure;
- Presence of chlorides in gritting salts can lead to increased deterioration;
- Increased traffic flow particularly as a result of the increased loading weight generated by Heavy Goods Vehicles;
- Natural ground heaving/or root vegetation can damage the structural integrity of assets, which can lead to further damage as a consequence of water ingress;
- Potential sub-standard materials, through corrosion, incorrect installation or design.

4 Carriageway Performance

The condition of Medway's Principal and Non-Principal Road Network is assessed using SCANNER (Surface Condition Assessment of the National Network of Roads) Survey. SCANNER is a machine-based survey that measures a range of condition parameters to create Road Condition Indicator (RCI) scores for every 10-meter section of the network. The Principal and Non-Principal Network is subject to a SCANNER Survey on a two-year rolling cycle (50% per annum). The condition of the Unclassified Road Network is assessed using a CVI (Coarse Visual Inspection) Survey, which is completed on a four-year rolling cycle.

4.1 National Comparison

The Carriageway Condition Performance in comparison to the National Averages as per DfT's Road Condition Report, can be seen within **Table 4.0**. This shows that Medway Council have maintained a positive outcome towards the condition of its Principal and Non-Principal Road Network, with better than average historical performance. This does also highlight a backlog in condition performance compared with the National Average for the Unclassified Network, suggesting that additional investment is necessary to improve its overall condition score.

% of Roads Requiring Maintenance	2016/17	2017/18	2018/19	2019/20	2020/21
% Principal Roads (Lower is better)	**2**	**2**	**2**	**1**	**2**
National Average for Principal Roads	3	3	3	-	-
% Non-Principal Roads (Lower is better)	**5**	**4**	**4**	**6**	**5**
National Average for Non-Principal Roads	6	6	6	-	-
% Unclassified Roads (Lower is better)	**14**	**20**	**23**	**21**	**20**
National Average for Unclassified Roads	17	16	16	-	-

Table 4.0 – National Road Condition, Local Authority Managed Roads 2020/21.

It is important to benchmark Medway Council's performance against the National Average, as ideally Medway's Network should be performing at or above the National Average Performance. Medway's Performance Target for Unclassified Roads has been set at 16% as detailed within **Table 4.7**, this will therefore align Medway's Unclassified Network with the National Average performance for Unclassified Roads. In addition, Medway's Unclassified Network is currently improving performance by 1% year-on-year due to focused investment, therefore it is anticipated to reach this performance target by 2025/26.

The National Average figures for financial years 2019/20 and 2020/21, have not yet been publicised by the Department for Transport, and haven't been included within **Table 4.0.** This hasn't therefore enabled the opportunity to benchmark Medway's performance data against the most recent National Average figures. In light of this, further benchmarking has therefore been undertaken with other key Highway Authorities which make up the South East Seven Group, in order to provide a comparison towards the most recent financial periods. Further details of this benchmarking can be seen within **Table 4.1**.

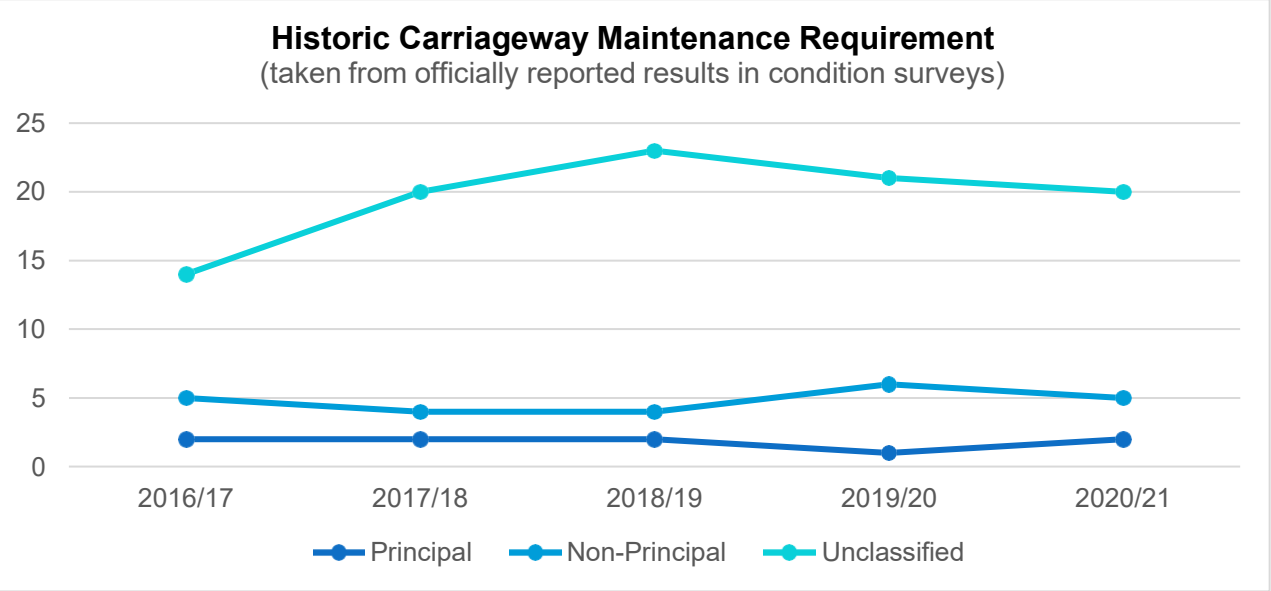

Figure 4.0 – Medway's Historic Carriageway Maintenance Backlog.

Medway Council is above the National Average for Principal and Non-Principal roads. The Unclassified Network however remains the largest part of Medway's Road Network, and therefore proportionally requires more investment to improve overall condition performance. Despite this, Medway's performance towards the Unclassified Network has improved in more recent years with a 3% condition improvement being achieved since 2018/19. This improvement was achieved through targeted investment as identified within the first cycle of lifecycle planning, which would otherwise have seen the Unclassified Network deteriorate to 24% in overall condition.

4.2 South East Regional Comparison

Benchmarking carriageway condition performance against other Local Highway Authorities is possible due to performance data being collated annually. From selecting Highway Authorities that make up the South East Seven Group within **Table 4.1** below, it can be seen that Medway Council is performing better in regards to its Classified Network, however Medway's Unclassified Network is comparatively one of the worst performing of the South East Seven Group.

Road Classification (SE Seven Group)	Brighton & Hove	Hampshire	Kent	Medway	Surrey	East Sussex	West Sussex
Principal Roads (A Class)	6%	5%	5%	2%	7%	4%	5%
Non-Principal Roads (B and C Class)	4%	5%	5%	5%	7%	4%	6%
Non-Principal Roads (B Class Only)	7%	5%	8%	3%	7%	4%	4%
Non-Principal Roads (C Class Only)	2%	5%	4%	5%	7%	5%	6%
Unclassified Roads	13%	5%	16%	20%	[1]	[1]	12%

Table 4.1 – South East Seven Performance Benchmarking by Road Classification 2020/21.

[1] No data was provided by Surrey County Council or East Sussex County Council for Unclassified Roads as part of the South East Seven Group benchmarking exercise.

The backlog in condition towards the Unclassified Network is a consequence from the historical prioritisation of maintenance on Medway's A and B Class Roads, at the expense of the Unclassified Network. The overall levels of highway maintenance funding allocated for carriageway resurfacing is also a contributing factor towards the deterioration of Medway's Unclassified Network. Medway's A and B roads represent approximately 16% of the total network, which is performing well, however this means that the Unclassified Roads which account for approximately 73% of the total network are performing worse than both the Regional and National Averages.

4.3 Carriageway Condition Forecast

4.3.1 Current Budget Provision

The annual budget for Carriageways in 2020/21 was £2.685 million. This was spent applying both thin (surface course only) and moderate (includes both surface and binder) treatments to the network as the following apportionment:

Road Classification	Road Area	Length	Budget (2020/21)	Moderate Surfacing	Thin Surfacing
	(m²)	(m)	(£)	(£)	(£)
A Class	860,125	101,691	350,731	158,944	191,787
B Class	215,361	32,075	57,562	12,500	45,062
C Class	486,061	85,045	325,894	19,078	306,816
Unclassified	4,045,833	607,938	1,950,426	1,021,930	928,496
Total	**5,607,380**	**826,749**	**2,684,613**	**1,212,452**	**1,472,161**

Table 4.2 – Carriageway Treatments Spend Profile during 2020/21.

A total of 39 Carriageway Maintenance Schemes were delivered during 2020/21 with an average treatment rate per meter square equating to £37.45 as identified below.

Carriageway Schemes (2020/21)	Number of Schemes	Total Cost	Network Resurfaced		Average
	(No.)	(£)	(m²)	(m)	(£/m²)
Highway Operations	30	2,026,368	61,646	9,254	£32.87
Highway Designs	9	86,576	1,244	207	£69.60
Responsive Maintenance	-	571,669	8,795	1,466	£65.00
Total	**39**	**2,684,613**	**71,685**	**10,927**	**£37.45**

Table 4.3 – Carriageway Scheme Output Costs during 2020/21.

4.3.2 Simple Replacement Frequency Calculation

With the above information it is possible to estimate the total cost to resurface Medway's entire carriageway network to be within the region of £210 million. If this is then divided by the current budget allocation towards carriageway maintenance during 2020/21 of £2.685 million, Medway's carriageway design lifespan based on current spending levels will occur once in every 78 years as **Table 4.4** below highlights.

Road Classification	Road Area	Resurfacing Cost	Network Renewal	Expenditure (2020/21)	Replacement Frequency
	(m²)	(£/m²)	(£)	(£)	(years)
A Class	860,125	37.45	32,211,681	350,731	92
B Class	215,361	37.45	8,065,269	57,562	140
C Class	486,061	37.45	18,202,984	325,894	56
Unclassified	4,045,833	37.45	151,516,446	1,950,426	78
Total	**5,607,380**	**37.45**	**209,996,380**	**2,684,613**	**78**

Table 4.4 – Road Class Renewal Frequency against Budget Provision during 2020/21.

This simple calculation indicates Medway's current funding levels are not sufficient to maintain a steady state condition over the long term. Typically, a carriageway surface should not be expected to last longer than 50 years without the needing to be resurfaced. The implications are that without an increase in budget to at least £4.2 million, the carriageway condition will continue to worsen over the longer term. By following a suitable design life, it ensures that Medway Council's Carriageway Network is renewed within a specified period of time, and consequentially reducing future reactive maintenance costs.

Table 4.5 below shows the levels of investment required to resurface Medway's entire carriageway network within the specified replacement period. For example, in order to resurface the entire network over 50 years, a total investment of £4.2 million will be required.

Road Classification	Carriageway Network Replacement Design Life and Resulting Cost					
	40 Years	50 Years	60 Years	70 Years	80 Years	90 Years
A Class	£805,292	£644,234	£536,861	£460,167	£402,646	£357,908
B Class	£201,632	£161,305	£134,421	£115,218	£100,816	£89,614
C Class	£455,075	£364,060	£303,383	£260,043	£227,537	£202,255
Unclassified	£3,787,911	£3,030,329	£2,525,274	£2,164,521	£1,893,956	£1,683,516
Total	**£5,249,910**	**£4,199,928**	**£3,499,940**	**£2,999,948**	**£2,624,955**	**£2,333,293**

Table 4.5 – Carriageway Replacement Frequency Budget Requirement.

4.3.3 HMEP Toolkit Modelling

From using the Carriageway HMEP Toolkit, it is possible to establish the predicted deterioration rates of the carriageway asset. This is typically modelled over a 10-year window in order to determine the quantities of carriageways which would be considered in 'Poor' condition. This is with any carriageways identified as being in poor condition as those which require maintenance, typically in the form of carriageway resurfacing, in the immediate to near future.

This modelling is used to determine what budget is necessary to achieve a specified outcome. In this instance the model is based on maintaining the Classified Road Network at or above 6% overall condition performance and the Unclassified Network at or above 16%

overall condition performance as shown in **Table 4.6**. This is in order to align Medway's Road Network performance to more closely align with the National Average.

Asset Group	Condition	Condition Following Recommended Lifecycle Budget Modelling										
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
A Class Roads	Good	85%	79%	76%	85%	81%	78%	86%	82%	78%	75%	85%
	Fair	14%	18%	21%	11%	16%	19%	11%	16%	19%	22%	12%
	Poor	2%	3%	3%	3%	3%	3%	3%	2%	3%	3%	3%
B Class Roads	Good	77%	73%	73%	72%	71%	71%	70%	70%	70%	69%	69%
	Fair	20%	22%	23%	24%	24%	25%	25%	26%	26%	26%	26%
	Poor	3%	5%	5%	4%	4%	4%	5%	5%	5%	5%	5%
C Class Roads	Good	69%	70%	70%	71%	72%	72%	72%	72%	73%	73%	73%
	Fair	26%	25%	24%	24%	23%	23%	23%	23%	23%	23%	23%
	Poor	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Unclassified Roads	Good	63%	67%	63%	61%	59%	63%	60%	58%	62%	59%	57%
	Fair	18%	21%	23%	25%	26%	26%	27%	27%	27%	27%	27%
	Poor	20%	12%	13%	14%	16%	11%	13%	15%	11%	14%	16%

Table 4.6 – Lifecycle Model Condition Projections for Carriageways over a 10-year period.

The modelling typically operates with an unlimited budget, assigning as much funding as required to maintain the performance thresholds. The projected annual budgets will therefore vary considerably from year-to-year in order to maintain the specified threshold. The model projects that £42.4 million will be required to maintain the above targets over the next 10-years given its current condition, which equates to approximately £4.235 million per year. This aligns closely with the 'Simple Replacement Frequency Calculation' completed earlier, in order to maintain the Carriageway Network on a 50-year replacement cycle.

Road Classification	Current Performance (%)	Target Performance (%)	Current Budget (£'000)	Required Budget (£'000)	Budget Shortfall (£'000)
Principal Roads (A Class)	2%	3%	2,085[2]	4,235	2,150
Non-Principal Roads (B Class)	3%	6%			
Non-Principal Roads (C Class)	5%	6%			
Unclassified Roads (U Roads)	20%	16%			

Table 4.7 – Desired Outcome from Carriageway Investment.

[2] In light of the Governments spending review following the decision to prioritise the response to Covid-19, Medway Council's budget allocation towards Carriageway maintenance is set to reduce by circa £600,000 from 2021/22 onwards. Taking this funding reduction into consideration when producing the Carriageway Lifecycle Model, the ongoing budget shortfall for carriageway maintenance will therefore be £2,150,000 over the next 10-year period.

4.4 Carriageway Summary

If Medway Council maintained carriageway performance above the targets identified within **Table 4.7** and strategically invested into the Unclassified Network, then approximately 31 km of the Unclassified Network will need to be resurfaced. At the current resurfacing output this would take over 3 years to achieve.

In order to improve the treatment output of the Unclassified Network, it is recommended to consider the use of 'thin surfacing' maintenance treatments in future. This is in order to treat the roads that fall within the 'fair' condition category, therefore preventing these roads from deteriorating into 'poor' condition within the short-term future. This combined with conventional surfacing on roads identified as being in 'poor' condition will effectively provide a two-pronged approach towards improving the Unclassified Road Network as a whole.

5 Footway Performance

The condition of Medway Council's Footway Network is assessed using a Footway Maintenance Survey (FMS) that scans 25% of the Network on an annual basis, therefore covering the full Network over a 4-year cycle. The FMS Survey measures a range of surface condition parameters and is recorded within Medway's Asset Management System, which is used to create a Footway Condition Indicator score against each footway material type.

Medway's approach of using the FMS Survey to capture and report on the condition of the Footway Network has changed since the first reporting cycle of Medway's Lifecycle Planning. The reasoning for this is because Medway's footway condition data was initially assessed across four condition bandings ranging from 'As New' through to 'Structurally Unsound'. The FMS Survey Condition data is now assessed on a Red/Amber/Green scoring process, which better aligns with the condition reporting format used for carriageways. This is with 'Red' identifying footways as being in 'Poor' condition, or those requiring maintenance. Medway's Footway Condition data doesn't require reporting to the DfT as a National Indicator Requirement, therefore benchmarking against the national performance levels isn't currently possible.

Surface Material	Area (m²)	Length (m)	Condition Banding		
			Good	Fair	Poor
Bituminous Surface	1,896,539	989,269	84.1%	12.2%	3.7%
Block Paved Surface	34,237	10,658	96.5%	3.5%	0%
Concrete Surface	75,957	14,753	88.4%	10.7%	0.8%
Flagged Surface	79,497	30,282	90.8%	7.5%	1.7%
Yorkstone Surface	510	258	100%	0%	0%
Mixed Surface	73,754	13,767	89.8%	8.2%	2%
Total of Surveyed	**2,160,494**	**1,058,987**	**84.9%**	**11.7%**	**3.4%**

Table 5.0 – Footway Maintenance Survey (FMS) Condition Results.

5.1 Footway Condition Forecast

5.1.1 Current Budget Provision

The annual budget for footway maintenance is £837,000 and a breakdown of the footway funding allocation during 2020/21 can be seen within **Table 5.1** below.

Treatment	Treatment Description	Resurfaced 2020/21		Budget (2020/21)
		Area (m²)	Length (m)	
Footway Patching	Bituminous Repair	9,633	5,386	£326,423
Footway Resurfacing	Bituminous Replace	8,444	4,573	£504,323
Footway Patching	Flagged Repair	56	37	£5,990
Total		**18,133**	**9,996**	**£836,736**

Table 5.1 – Footway Treatment Spend Profile during 2020/21.

5.1.2 Simple Replacement Frequency

The information included within **Table 5.2** below shows that the total cost to resurface Medway's entire footway network is within the region of £106 million. By using a simple replacement frequency calculation and dividing this value by the annual footway resurfacing budget of £837,000, Medway's footway design lifespan based on current spending levels will occur once in every 126 years.

Surface Material	Footway Area	Footway Length	Treatment Cost	Network Renewal
	(m²)	(m)	(£/m²)	(£)
Bituminous	1,896,539	989,269	45.51	86,311,489
Block Paved	34,237	10,658	54.26	1,857,700
Concrete	75,957	14,753	45.51	3,456,803
Flagged	79,497	30,282	134.74	10,711,425
Yorkstone	510	258	134.74	68,717
Mixed Surface	73,754	13,767	45.51	3,356,545
Total	**2,160,494**	**1,058,987**	**76.71**	**105,762,679**

Table 5.2 – Footway Network Renewal Frequency

This calculation indicates Medway's current funding levels are not sufficient to maintain a steady state condition over the long term because a footway surface is not expected to last longer than 70 years. **Table 5.3** below shows the levels of investment required to resurface Medway's entire footway network within the specified replacement periods. For example, in order to resurface the entire network over 70-year design life, a total annual investment of £1.5 million will be required.

Surface Material	Footway Network Replacement Design Life and Resulting Cost					
	40 years	50 years	60 years	70 years	80 years	90 years
Bituminous	2,157,787	1,726,230	1,438,525	1,233,021	1,078,894	959,017
Block Paved	46,443	37,154	30,962	26,539	23,221	20,641
Concrete	86,420	69,136	57,613	49,383	43,210	38,409
Flagged	267,786	214,229	178,524	153,020	133,893	119,016
Yorkstone	1,718	1,374	1,145	982	859	764
Mixed Surface	83,914	67,131	55,942	47,951	41,957	37,295
Total	**2,644,067**	**2,115,254**	**1,762,711**	**1,510,895**	**1,322,033**	**1,175,141**

Table 5.3 – Footway Replacement Frequency Budgets.

5.1.3 HMEP Toolkit Modelling

From using the Footway HMEP Toolkit, it is possible to establish the predicted deterioration rates of the footway asset. This is typically modelled over a 10-year window in order to determine the quantities of footways which would be considered in 'Poor' condition. In this instance the model is based on maintaining the Footway Network at or above 5% overall condition performance as shown in **Table 5.4** below.

As the standard deterioration rates typically used within the HMEP toolkit appeared to be too aggressive and were therefore lowered to produce more realistic projections over the long term against current budget provision.

Asset Group	Condition	Condition Following Recommended Lifecycle Budget Modelling										
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Bituminous Surface	Good	84%	81%	78%	76%	74%	71%	69%	67%	65%	63%	61%
	Fair	12%	15%	18%	21%	23%	25%	27%	29%	30%	32%	34%
	Poor	4%	4%	4%	4%	4%	4%	4%	4%	5%	5%	5%
Block Paved Surface	Good	96%	94%	92%	91%	89%	87%	86%	84%	83%	81%	80%
	Fair	4%	6%	7%	9%	11%	12%	14%	15%	16%	18%	19%
	Poor	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Concrete Surface	Good	88%	85%	82%	79%	76%	73%	71%	68%	66%	64%	61%
	Fair	11%	14%	17%	20%	23%	25%	28%	30%	32%	34%	36%
	Poor	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%
Flagged Surface	Good	90%	86%	83%	80%	76%	73%	70%	68%	65%	62%	60%
	Fair	8%	12%	16%	19%	22%	25%	27%	30%	32%	34%	36%
	Poor	2%	2%	2%	2%	2%	2%	2%	3%	3%	4%	5%

Table 5.4 – Lifecycle Model Condition Projections for Footways over a 10-year period.

From using the HMEP modelling to determine the required levels of investment to maintain a 5% performance outcome against the footway asset, this calculated an average budget of £1.15 million per year as being required commencing from 2023/24 financial period.

Surface Material	Current Performance	Target Performance	Current Budget	Required Budget	Budget Shortfall
	(%)	(%)	(£'000)	(£'000)	(£'000)
Total of Footway Network Surveyed	3.4%	5%	840	1,150	310[3]

Table 5.5 – Desired Outcome from Footway Investment

[3] Commencing from 2023/24 onwards over the next 10-year period.

The HMEP Toolkit modelling typically operates with an assumed unlimited budget, therefore assigning as much funding as required to maintain the identified 5% performance threshold. The model projects that a total of £11.5 million will be required to maintain the above targets given its current condition.

This shows that the footway lifecycle model doesn't align with the 'Simple Replacement Frequency' calculation produced earlier, whereby an annual budget of £1.5 million per year was identified. The reason for this is because the simple replacement frequency calculation doesn't use technical condition forecast modelling as per the HMEP Lifecycle Toolkit, and therefore the budgets identified through the toolkit are a more accurate representation of the condition forecast and budget requirement for the footway asset in the medium to long-term.

5.2 Footway Summary

Medway's Footway Network is performing well in terms of overall condition performance, however the modelling forecast trend does indicate a decline in performance over the medium to long-term future. To prevent further deterioration of the footway network, investment is necessary to reduce the period of time it takes to renew the whole network. Alternative methods of footway maintenance should therefore be considered to treat those footway idented as being in 'Fair' condition. This typically comprises of preventative maintenance techniques within the aim at reducing the number those footways identified as being in 'Fair' condition from deteriorating into 'Poor' condition.

6 Structures Performance

The Highway Structures Lifecycle is modelled using the Structures Asset Valuation and Investment (SAVI) Toolkit. This identifies the replacement cost of structures against current condition data in order to determine the levels of investment required. Several key valuation terminologies are used during this process, which consist of the following:

- Gross Replacement Cost (GRC) represents the cost of replacing the existing asset with a new modern equivalent asset;
- Depreciated Replacement Cost (DRC) represents the GRC less the value of the deductions for physical deterioration;
- Depreciation is the cost of all capital treatments required to restore full service to the asset spread over the number of years considered in the lifecycle.

Medway's current Highway Structure inventory stands at 183 assets, (excluding the Medway Tunnel), which is comprised of a further 1,223 elements. The total value to replace Highway Structures (GRC) is currently valued at £416 million as indicated in **Table 6.0**.

Structure Type	Quantity	GRC	DRC	Depreciation	DRC as % of GRC
	(No.)	(£)	(£)	(£)	(%)
Bridges (including Footbridges)	52	57,752,125	42,054,812	15,697,313	72.8%
Retaining Walls	95	15,535,538	8,447,629	7,087,909	54.4%
Culverts	12	961,080	742,466	218,615	77.3%
Sign/Signal Gantries	5	610,886	564,548	46,338	92.4%
Tunnels and Vehicular Underpass	10	336,824,421	303,841,204	32,983,216	90.2%
Other	9	3,963,628	2,719,986	1,243,642	68.6%
Full stock	**183**	**415,647,678**	**358,370,644**	**57,277,033**	**86.2%**

Table 6.0 – Valuation Results per Structure Type 2020/21.

Cyclical inspection programmes are used to inform a work programme that is completed on the following maintenance cycles:

- General Inspections occur every two years, and;
- Principal Inspection occur every six years.

Condition reports use a number of performance indicators dependent on the Structure type to help determine the overall condition and structural integrity. Performance indicators measured against each highway structures asset are primarily made up of two factors influencing the condition.

- The Bridge Structural Stock Condition Indicator (BSSCI) and the;
- Bridge Structure Condition Indicator (BSCI).

Highway Structure Assets have inspection and condition data collected in accordance with CSS Bridge Condition Indicators Volume Two from the Management of Highway Structures (2005) Code of Practice. Each Highway Structure will have a number of key elements that make up the Highway Asset. It is each of these elements that are assessed using the BSSCI and BSCI to give an overall Bridge Condition Indices (BCI).

The BCI informs a programme of priority works for each Highway Structure, dependent on the overall condition levels. The minimum score a Structure must achieve is a BCI of 70%, anything below this would be deemed that the Highway Structure Asset is potentially not fit for purpose unless immediate steps are taken towards maintaining key elements of the Structure. The BCI Score is typically broken down into the following categories:

- BCI $_{\text{Average:}}$ Includes all elements of the structure;
- BCI $_{\text{Critical:}}$ Only includes elements which are critical to the structure.

Asset group	Performance Detail	Highway Asset Sub-Category	BCI Performance	
			Average	Critical
Highway Structures	Bridge Condition Index (Average and Critical) below 70%. (BCI) - Minimum 70% before safety measures and weight restrictions apply.	Retaining Wall	95.2%	76.2%
		Culvert	100%	100%
		Sign Gantry	100%	100%
		Pedestrian Subway	100%	100%
		Footbridge	100%	87.5%
		Tunnel	100%	100%
		Bridges	95.7%	91.3%
		Miscellaneous Structures	100%	100%

Table 6.1 – Highway Structures Bridge Condition Indicator (BCI) Performance.

Three of the Sub-Category groups indicate that there is a percentage the asset as being in critical condition, however it is important to recognise that the indicated percentage consists of elements of the overall Structure and not the complete structure itself. Therefore by replacing those structural elements identified as being critical, will inadvertently bring the overall condition performance of the structure back into a reasonable state of condition.

The following **Table 6.2** quantifies the BCI figures into more easily interpretable condition bandings. This also enables a comparison to be made against the first Structures Lifecycle, with there being some identifiable improvements made towards the condition performance percentages, with less 'Poor' and 'Very Poor' Structures being identified.

Condition Band	Performance Condition (2017/18)	Performance Condition (2020/21)
	(%)	(%)
Very Good	39	30
Good	33	41
Fair	16	24
Poor	9	5
Very Poor	3	0

Table 6.2 – Highway Structures Condition Performance Comparison.

It is important to note that the Medway Tunnel has not been included as part of the Structures Lifecycle modelling. This is due to the vast majority of the Tunnel budget being allocated towards mechanical and electrical maintenance, which does not directly improve the structural condition of the Bridge Condition Indicator scores.

The capital investment from the DfT Tunnel Challenge Fund Scheme would also distort the lifecycle modelling outputs if this capital investment was included within the Structures Lifecycle modelling process. An alternative approach is to capture Medway Tunnel using a bespoke lifecycle model, once the Challenge Fund Scheme has been completed in the

future. In addition the Green Street Footbridge scheme has been successfully completed, which will reflect positively in the future performance reporting for the Structures BCI Performance figures.

6.1 Structures Condition Forecast

6.1.1 Current Budget

The Structures Budget during 2020/21 was £540,000, which consisted of Capital and Local Transport Plan (LTP) budget allocations. The Highway Structures budgets include inspections, which generally do not have any effect towards improving Structure's condition performance and therefore in reality the Structures Budget is £390,000 from a maintenance only perspective.

Structures Budget (2020/21)	Amount (£'000)
Maintenance	390
Inspections (average estimate)	150
Total	**540**

Table 6.3 – Highway Structures Budget Provision in 2020/21.

Currently no structures have been identified as being in 'Very Poor' condition, as shown in **Table 6.2**. The structures budget is therefore sufficient in maintaining condition performance over the short-term. Maintenance towards critical components is however inevitable and will often require a large investment to address. It is unlikely that this level of investment will be required until the long-term future, and it is therefore the intention to address this from one-off capital investment bids, where appropriate.

6.1.2 Modelling Outcome

Asset Inventory Data for Highway Structures are held within Medway Council's Asset Management System, which has been used to inform the Structures Lifecycle Model. Bridge Condition Indicator Reports with condition data have also been used to inform the Model to determine the Lifecycle of each Highway Structure.

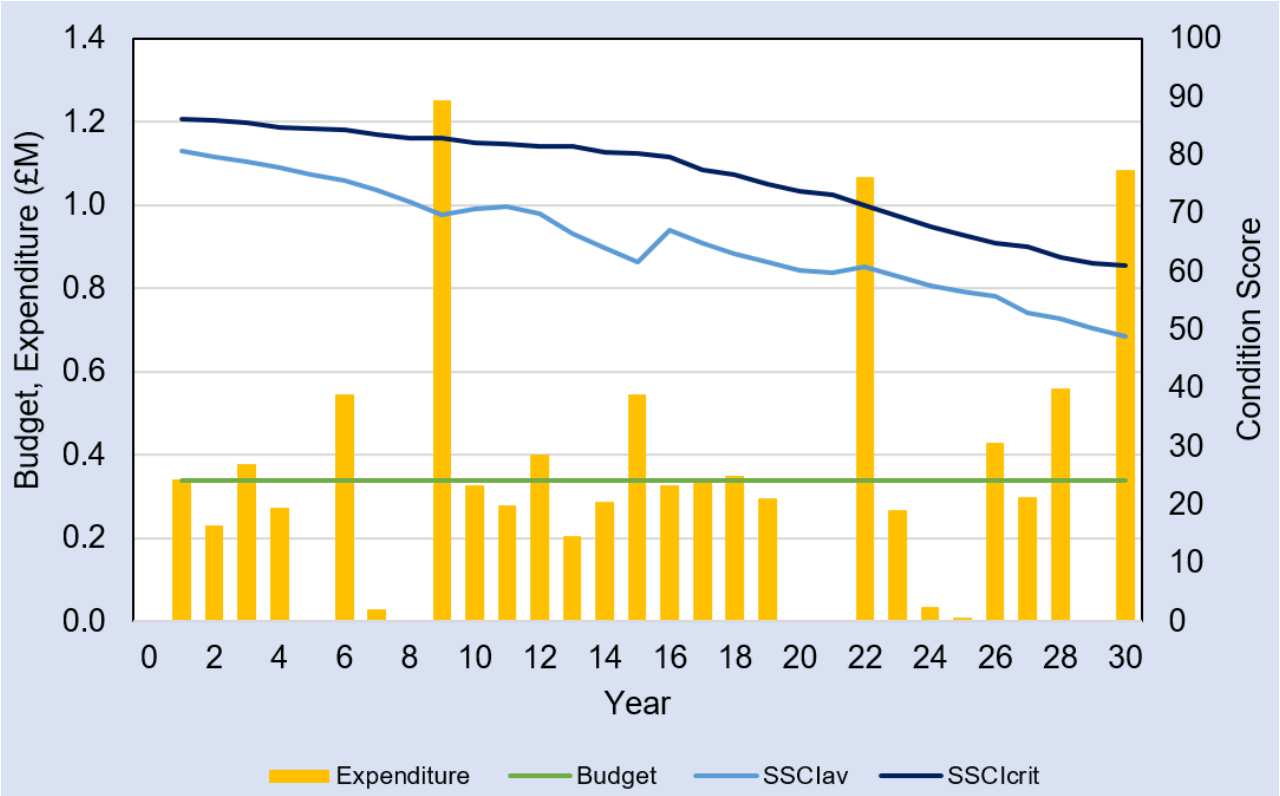

Figure 6.1 – Projected Structures Budget, Expenditure and Condition Results.

The above **Figure 6.1** shows that under current budget provision towards both the BCI Structure Stock Condition Indices Average (SSClav) and BCI Structure Stock Condition Indices Critical (SSClcrit) condition indicators, the entire structures stock will deteriorate gradually over the next 30 years. As a consequence, this will increase the backlog of maintenance required, unless further investment is made.

It is important to recognise that when a Highway Structure's BCI score falls below 70% it can be considered for closure, or weight restrictions could be applied to that structure, subject to the appropriate risk assessment at the time. Depending on the location of the structure, this may therefore incur network disruption and resulting traffic delay cost.

From using the Highway Structures current condition and budget allocations, the lifecycle modelling has projected the Average Condition against all structures related assets over the next 30 years, which can be seen within **Figure 6.2** below.

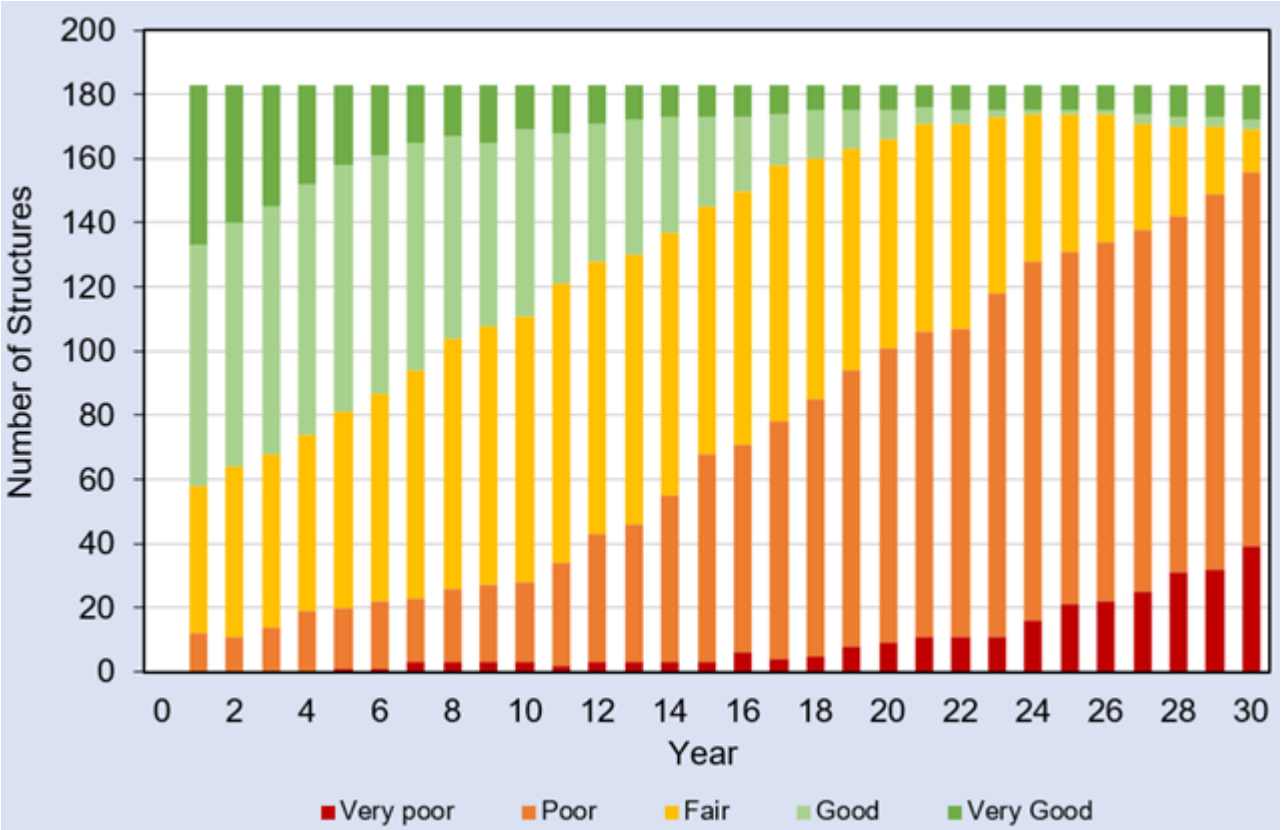

Figure 6.2 – Structures Lifecycle Model Condition Projections for 2020/21 budget allocation.

6.2 Structures Summary

As no Highway Structures are currently in 'Very Poor' condition, lifecycle modelling has focused on cyclical structures repairs only. Any structure requiring full replacement in the long-term future will instead be subject to capital funding bids, as to dissipate the cost of a full Highway Structure replacement over the course of the lifecycle modelling will amount to a vast annual budget requirement. By focusing on cyclical maintenance only, ensures that the lifecycle budget modelling is not distorted over the short to medium-term.

The 'workbank' (performance backlog) for Highway Structures is projected to be £58 million after 30 years even after the current 30-year budget has been taken into account. Medway's 'Discounted Workbank' is calculated to be £22.5 million which equates to £750,000 per annum. Lifecycle modelling therefore recommends an annual Structures budget of £750,000 to maintain condition performance levels.

Highway Structures	Target Performance	Current Budget	Required Budget	Budget Shortfall
		(£'000)	(£'000)	(£'000)
All Highway Structures Assets	0% for BCI Critical Below 70%	390	750[4]	360[5]

Table 6.3 – Desired Outcome from Highway Structures Investment.

[4] When a highway structure reaches the end of its service life and requires complete renewal, the cost for its replacement will inevitably be exceptionally high. In light of this, Lifecycle Modelling typically predicts when structural renewal is due to take place and spreads the cost of this work across a number of financial years in order to make it more realistically viable. It is however more practical to secure this funding by direct capital investment when required, due to the fact that highway budgets cannot be banked over a number of financial years. The current budget provision towards Highway Structures is therefore sufficient in maintaining the required levels of performance over the short-term.

[5] Identified budget shortfall to commence from 2025/26 onwards over the next 10-year period.

7 Street Lighting Performance

Medway Council holds an extensive database inventory against its Street Lighting Assets, which are kept up to date within Medway's Highway Asset Management System. Medway's Street Lighting inventory can be seen within **Table 7.0** below.

Asset Description	Material	Highways Maintainable	Total Quantity
Belisha Beacon		105	105
Feeder Pillar		173	173
Flector Bollard		39	39
Illuminated Bollard		1,297	1,297
Illuminated Sign		1,892	1,892
Refuge Island Indicator		255	255
School Flasher		32	32
Street Light (Lamp Column)	Steel	10,729	26,310
	Galvanised	3,248	
	Aluminium	8,204	
	Concrete	3,496	
	Other	633	
Subway Fitting		121	121

Table 7.0 – Medway Council's Street lighting Asset Inventory 2020/21.

The Street Lighting Prudential Borrowing Scheme which extended over 2018/19 and 2019/20 replaced over 1,900 Lamp Columns, and the Street Lighting LED Scheme, which commenced in 2021/22, will oversee the replacement of a further 4,600 lamp columns that are past their design life. Both of these Capital Investments will have a direct impact on the overall condition performance on Medway's Lamp Column Network. Lamp Columns however are not the only asset to account for, but they do represent the largest combined value and as such, are therefore the focus of this Street Lighting lifecycle report. It should be noted that the model does not include projections for replacing illuminated signs, bollards, and other associated street lighting assets.

Within the 'Street light' category there are 11 different types of lamp column on the network, however 97% of the overall inventory falls into four main categories. These four categories consist of the following lamp column materials including; Steel, Galvanised, Aluminium and Concrete, which have therefore been used to develop the Street Lighting Lifecycle Model.

Lamp column condition survey data is currently recorded within a specialist Street Lighting Asset Management System, however this only accounts for a percentage of the overall network. An alternative approach towards establishing the condition of Medway's entire Street Lighting Column stock is to evaluate overall lamp column condition based on installation date, whereby older columns are assumed to be in worse condition based on their overall service life expectations.

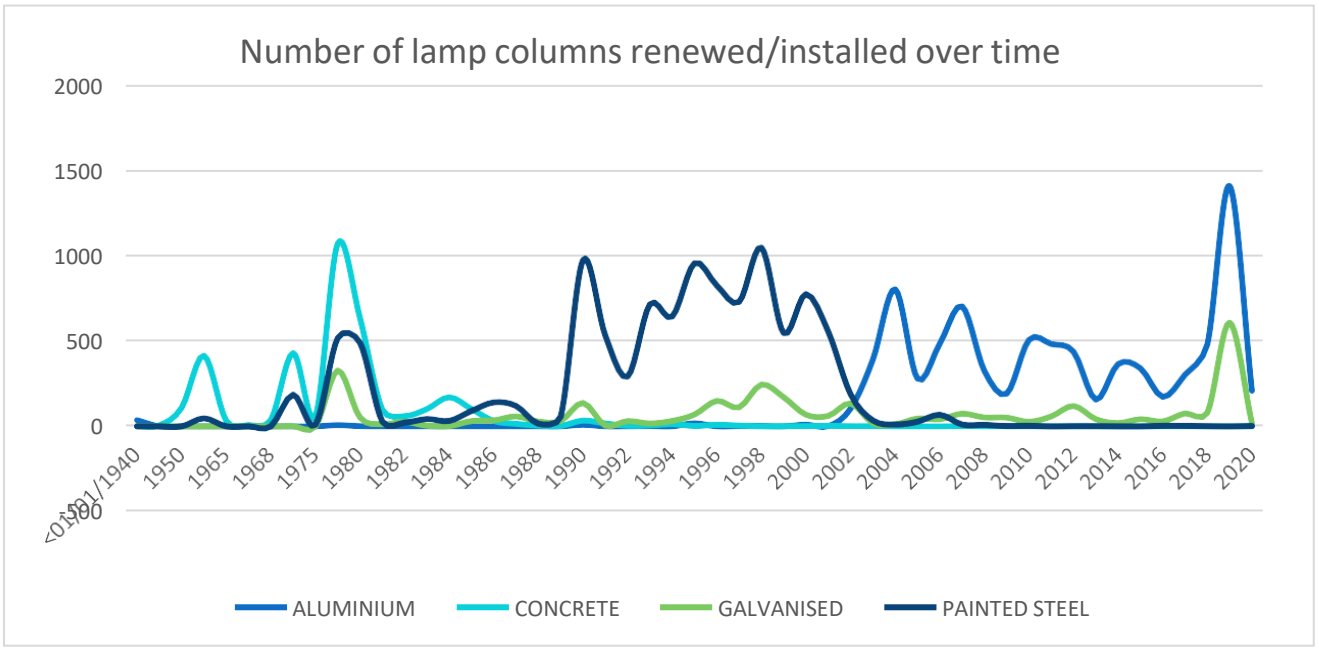

Figure 7.0 – Street Lighting Column Type and Installation Date

Medway's Lamp Columns have the following condition profile based on their current age and expected service life. Those that have been identified as being in 'Poor' condition, represent lamp columns which have already exceeded their expected service life and 'Fair' condition are those approaching the end of their service life.

Column Type	Replacement Cost	Service Life	Condition Banding		
(material)	(£)	(years)	Good	Fair	Poor
Steel	1,620	35	365	9,090	1,274
Galvanised	1,620	40	1,543	1,311	394
Aluminium	1,620	50	8,118	50	36
Concrete	1,620	50	3	2,459	1,034
Other	1,620	40	11	617	5
Total			**10,040**	**13,527**	**2,743**

Table 7.1 –Street Lighting Column Condition Profile 2020/21.

Other factors that can typically affect the lifespan of the Street Lighting Columns include:

- The type of material the column is constructed for which in Medway can include Steel, Concrete, or Aluminium and therefore determines different lifespans;
- Damage caused from passing vehicles;
- Cracks developing along the structure from adverse weather conditions;
- Internal and external corrosion.

In 2017/18 Medway Council's Street Lighting Team undertook a Structural Testing Programme to determine a more accurate reading of the current condition levels of Street Light Columns. These Structural Testing programmes should be undertaken every 6 years to determine the structural condition for compliance with legislation and in accordance with guidance from BS5649/EN40 and the Institution of Lighting Professionals Technical Report 22 (2007). The condition of lamp columns in this cycle of lifecycle planning is based on the age of the column, with older columns assumed to be in worse condition. It is the intention to more actively use column structural testing condition data within the next review cycle of this lifecycle planning report.

7.1 Street Lighting Condition Forecast

7.1.1 Current Budget

The annual budget for lamp columns replacement in 2020/21 was £1.74 million. This consisted of combination of highways street lighting budgets which are used towards lamp column maintenance, and any lamp column works undertaken by Capital Projects. The Street Lighting Prudential Borrowing scheme funding has also been included within the lifecycle modelling, which is based on an annual average spend against lamp column replacements only.

Lamp Column Maintenance (2020/21)	Total Cost (£)
Highway Street Lighting	398,925
Highway Designs	44,148
Prudential Borrowing (annual average)	1,299,483
Total	**1,742,556**

Table 7.2 – Street Lighting Budget allocations in 2020/21.

The total value of the Street Lighting Prudential Borrowing Scheme, which extended over financial years 2018/19 and 2019/20, was £2,729,010. It has been calculated that the portion of this spent against street lighting columns totalled £2,598,965 across both financial years.

As part of the Street Lighting LED replacement scheme, which is due to be completed in Summer 2022, Medway Council is going to replace over 4,600 lamp columns (all concrete columns and then remainder as steel) at a total cost of £1,488,892. The LED scheme commenced in 2021/22 and extended over three financial years, with a total budget of approximately £11 million. During the tendering stage, a good rate for replacement street lighting columns was secured as part of this project, which will see considerable improvements towards the street lighting lifecycle modelling in future. The conversion from standard lanterns to more energy efficient LED lanterns will also reduce ongoing street lighting energy usage in future.

7.1.2 Simple Replacement Frequency Calculation

The above **Table 7.1** shows the lamp column condition based on age of asset against the industry standard of design life for street light column material type. Aluminium lamp columns are typically the chosen material type used when the lamp column is being replaced, regardless of what the existing column material type may be. This is because aluminium lamp columns have one of the longest design lifespans of up to 50 years. Galvanised columns are also used as the second most common replacement option, particularly in locations where fold-down columns are necessary. With this in mind, a treatment option for aluminium columns was used within this street lighting lifecycle.

Each aluminium replacement costs £1,620 and there are currently 26,310 Highways maintainable lamp columns on Medway Councils network, therefore:

Cost to replace entire network lamp columns = £42.6 million
Aluminium column Lifespan (50 years) = £852,444 per year

This shows that the current budget provision of £1,74m towards the maintenance of lamp columns is more than sufficient towards the replacement of the Medway Councils lamp column stock within the 50-year lifespan. It is however worth bearing in mind that this simple calculation doesn't allow for price increases towards lamp column replacements over the long-term future, and that levels of investment are currently higher for lamp column renewal

due to the Prudential Borrowing Scheme followed by the Street Lighting LED Replacement Scheme.

Although there are currently a high number of lamp columns overdue for replacement, the 4,600 lamp columns being replaced as part of the Street Lighting LED Scheme will address a large portion of lamp columns in poor condition and will completely remove concrete lamp columns from Medway's network.

7.1.3 Modelling Outcome

Currently no standard HMEP deterioration matrix exists for lamp columns, and to therefore enable effective lifecycle modelling, a matrix was developed in line with industry standard service life expectations.

The performance based HMEP Lifecycle model was set to reduce and maintain the number of columns identified in 'Poor' condition to 10% as the overall treatment strategy. The HMEP Toolkit modelling typically operates with an assumed unlimited budget, therefore assigning as much funding as required to maintain the identified 10% performance threshold.

The model determined this would require £9.5 million to achieve (an average of £950,000 per year for the next 10 years). This is close to the simple replacement frequency completed earlier in this report.

Column Type	Current Performance	Target Performance	Current Budget	Required Budget	Budget Shortfall
	(%)	(%)	(£'000)	(£'000)	(£'000)
Highways Lamp Columns	11%	10%	540	950	410[6]

Table 7.3 - Desired Outcome from Lamp Column Investment during 2020/21.

[6] Identified budget shortfall to commence from 2025/26 onwards over the next 10-year period.

By taking the annual budget use for lamp column replacement in 2020/21 of £1.74m and comparing this against the HMEP modelled budget requirement of £950,000, this highlights that the current budget provision is sufficient towards maintaining lamp columns over the short-term future.

The fixed capital investment from the Street Lighting Prudential Borrowing and LED Replacement Scheme has had a considerable impact on the condition performance of Medway Council's lamp column asset. Upon completion of the LED Scheme however, further investment will be necessary to ensure that a target performance of 10% is maintained in the medium to long-term. Taking this into consideration when producing the Street Lighting Lifecycle Model, the typical budget for lamp column replacement is within the region of £540,000, therefore the budget shortfall commencing from 2024/25 onwards will be £410,000 over the next 10-year period.

7.2 Street Lighting Summary

Good progress has been made towards the Street Lighting asset since the first lifecycle modelling. Approximately £2.6 million has been spent on lamp columns from Prudential Borrowing over financial years 2018/19 and 2019/20. Further to this, the LED replacement scheme, will replace all the life-expired concrete columns and approximately half of the life expired steel columns.

This investment will significantly reduce the number of lamp columns identified as being past their life expectancy from approximately 34% down to 20%. The Street Lighting Team will monitor the outcome of this investment and improve the lifecycle model in the next round by using inspection records and will include other Lighting Assets within the scope of the model in future.

8 Drainage Performance

The main function of Medway Council's Drainage Assets is to remove surface water from the Highway to outfalls or watercourses, thereby reducing the amount of standing water on the road and consequentially enabling traffic to pass safely. Medway Council's Highway Department currently hold inventory data on Highway Drainage Assets within specialist Asset Management Systems.

There currently isn't an industry standard to record drainage condition data, and local knowledge and Engineering expertise has been used during the modelling of the Lifecycle Toolkit. The condition of Medway's highway gully assets has for example been based upon a mixture of how many gullies are in need of replacing and reported silt levels.

Asset Description	Quantity	Units	% of Assets in Condition Banding				
			Very Good	Good	Fair	Poor	Very Poor
Pipe	226,000	m	25%	20%	40%	10%	5%
Gully	35,571	No.	25%	40%	25%	5%	5%
Manhole or Catchpit	5,442	No.	30%	20%	40%	5%	5%
Ditches and Grips	164,000	m	5%	20%	40%	30%	5%
Linear Drainage	5,000	m	25%	40%	25%	5%	5%
Outfalls, SuDS or Soakaways	288	m	25%	40%	25%	5%	5%
Flap Valves	109	No.	20%	10%	50%	15%	5%
Interceptor	3	No.	100%	0%	0%	0%	0%

Table 8.0 – Drainage Assets and their Condition Banding during 2020/21.

The drainage asset condition banding as detailed within **Table 8.0** assesses the condition of each asset group ranging from 'Very Good' condition (newly installed) though to 'Very Poor' condition (requires immediate renewal). It should be noted that there is a degree of uncertainty surrounding the condition of Medway Council's underground drainage assets due to insufficient inventory data. This is commonly the case with many Local Highway Authorities, as to survey the full drainage network would amount to exceptional high costs.

Performance Indicator	Unit	2016/17	2017/18	2018/19	2019/20	2020/21
Highway gullies that are free flowing and clear of obstruction.	%	84	68	94	90	89
Number of enquiries due to flooding/drainage.	No.	489	499	578	381	291

Table 8.1 – Extract from Medway Council's Performance Management Framework.

8.1 Drainage Condition Forecast

8.1.1 Current Budget Provision

The annual budget for drainage maintenance is £353,000 including any major drainage works undertaken by the Highways Capital Projects team. The drainage budget allocation excludes cyclical drainage activities as cyclical maintenance does not improve the assets condition performance. A breakdown of the drainage funding allocation during 2020/21 can be seen within **Table 8.2** below.

Drainage Asset	Quantity	Unit	Average Unit Cost	Network Renewal	Budget (2020/21)	Renewal Frequency
				(£)	(£)	(years)
Pipe	226,000	m	£350	79,100,000	145,000	546
Gully	35,571	No.	£500	17,785,500	75,000	237
Manhole or Catchpit	5,442	No.	£2,600	14,149,200	31,000	456
Ditches and Grips	164,000	m	£120	19,680,000	9,000	2,187
Linear Drainage	5,000	m	£240	1,200,000	14,000	86
Outfalls, SuDS or Soakaways	288	No.	£8,000	2,304,000	79,000	29
Flap Valves	109	No.	£400	43,600	0	-
Interceptor	3	No.	£5,250	15,750	0	-
Total				**134,278,050**	**353,000**	**380**

Table 8.2 – Drainage Asset Quantities, Budget and Renewal Frequency during 2020/21.

8.1.2 Simple Replacement Frequency Calculation

With the above information it is possible to estimate the total cost to replace Medway's entire drainage network to be within the region of £134 million. If this is then divided by the current budget allocation during 2020/21 of £353,000, Medway's current drainage replacement frequency will occur in every 380 years. This shows to be an unsustainable expectation for service life of drainage assets between renewal interventions in the long term, and therefore indicates the current funding levels are not sufficient to maintain a steady state condition over the longer term.

Typically, highway drainage assets should not be expected to last longer than 120 years without requiring replacing, which aligns with the typical design life for a Highway Structure. The simple calculation produced within **Table 8.3** below shows the predicted budget requirements against each Drainage Asset Group to maintain the specified design life. From looking at the 120-year design life, this estimates a £1.1 million annual budget requirement in order to renew all drainage assets within this 120-year replacement cycle.

Road Classification	80 Years	100 Years	120 Years	140 Years
Pipe	£988,750	£791,000	£659,167	£565,000
Gully	£222,319	£177,855	£148,213	£127,039
Manhole or Catchpit	£176,865	£141,492	£117,910	£101,066
Ditches and Grips	£246,000	£196,800	£164,000	£140,571
Linear Drainage	£15,000	£12,000	£10,000	£8,571
Outfalls, SuDS or Soakaways	£28,800	£23,040	£19,200	£16,457
Flap Valves	£545	£436	£363	£311
Interceptor	£197	£158	£131	£113
Total	**£1,678,476**	**£1,342,781**	**£1,118,984**	**£959,128**

Table 8.3 – Drainage Replacement Frequency Budgets.

There is however a degree of uncertainty surrounding the condition of Medway Council's underground drainage assets due to insufficient inventory and condition data. This is commonly the case with many Highway Authorities, as to survey the entire drainage network would amount to exceptional high costs. Bearing this in mind, the above drainage replacement frequencies are therefore based on estimation.

In order to provide more accurate budget forecasting, the following drainage lifecycle modelling has instead focused solely on highway gullies due to this asset group holding good inventory and condition data. This is until Medway Highways are in a position to re-model against all drainage assets once more accurate data is collated.

8.1.3 HMEP Toolkit Modelling

As part of the Drainage Toolkit, Medway Council formally adopt the 'Markov Model' which provides a method of forecasting the lifecycle investment for Highway Drainage Assets. Due to the nature of drainage assets performance, this lifecycle typically models over a 50-year period. From modelling current budget provision against the highway gully asset group, it is possible to determine the deterioration profile in order to identify the percentage of asset considered to be in very poor condition.

The following **Figure 8.0** provides the condition grade profile based on current budget allocation for the maintenance of highway gullies. This is clearly showing a decline in asset performance over the 50-year period against current budget provision identified in 2020/21, with those highway gullies in very poor condition being identified in red.

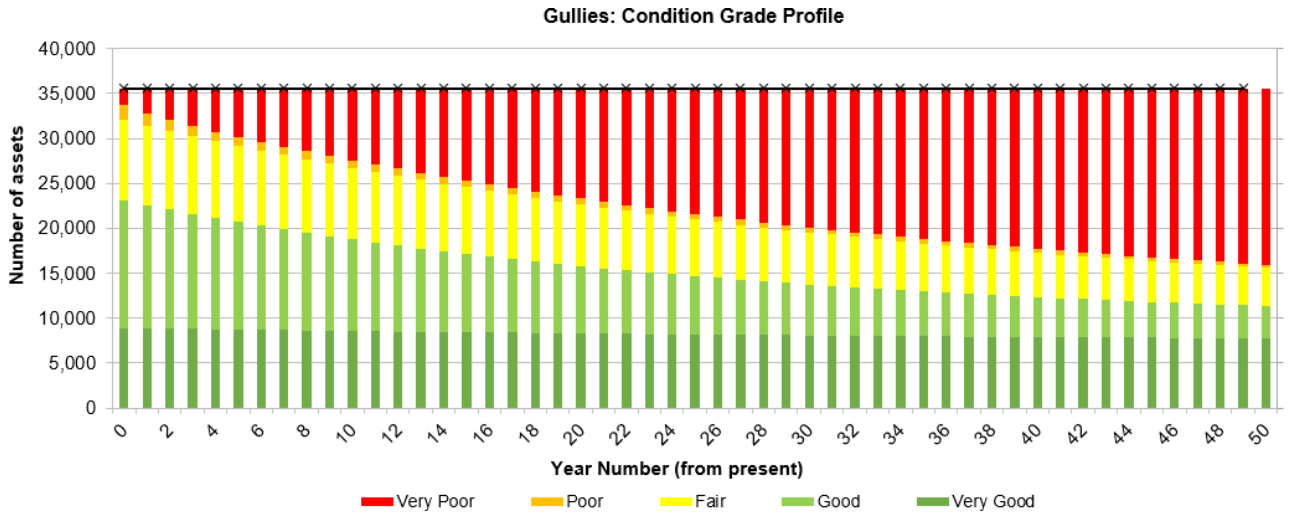

Figure 8.0 – Gully Condition Profile based on Current Budget Provision in 2020/21.

In order to prevent the decline in highway gully performance, the lifecycle modelling predicts that the annual budget allocation for the maintenance of highway gully assets should be £170,000, which indicates an annual investment shortfall of £95,000.

Drainage Asset	Current Budget	Required Budget	Budget Shortfall
	(£'000)	(£'000)	(£'000)
Highway Gullies	75	170	95

Table 8.4 – Drainage Lifecycle Modelling Drainage Gully Budget Shortfall.

The above increased investment would prevent the deterioration of the gully asset, therefore maintaining a steady state of condition performance, as demonstrated within **Figure 8.1** below. This doesn't align with the Simple Replacement Calculation completed earlier due to this being calculated across all drainage assets on an 120-year replacement cycle.

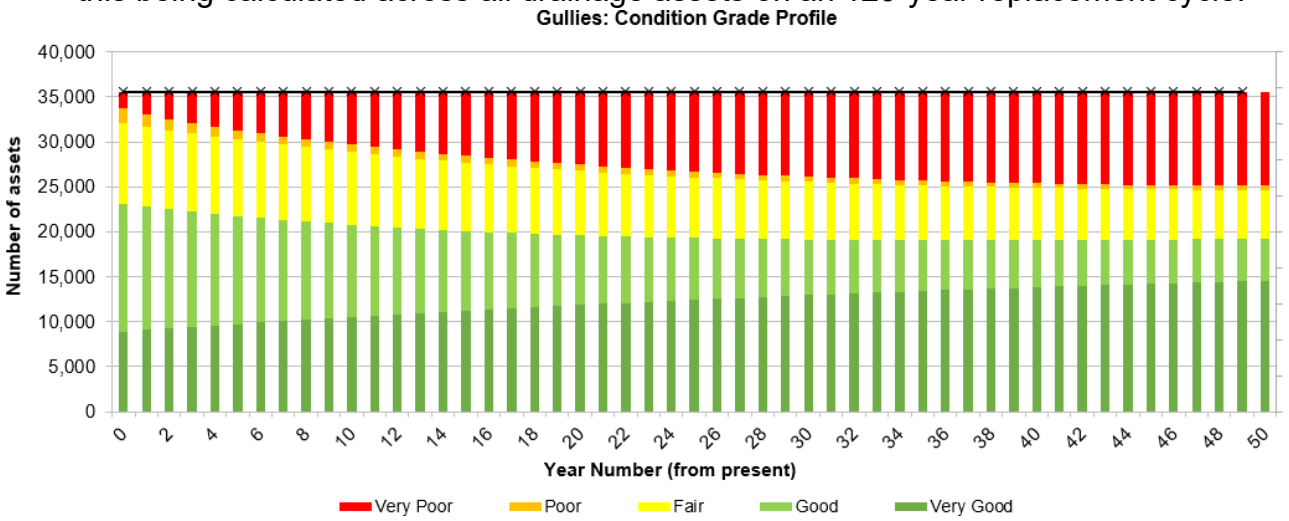

Figure 8.1 – Gully Condition Profile based on Lifecyle Modelling Recommendations.

8.2 Drainage Summary

The above Drainage Lifecycle Modelling has been based on maintaining a steady-state of condition performance towards the gully asset only. Until more sufficient inventory and condition data can be obtained from the remining drainage assets, modelling against these assets can only be based on assumption, therefore the figures included within the 'Simple Replacement Frequency Calculation' are subject to change in future. In order to make the Drainage Lifecycle Modelling more accurate in future, it is recommended to commission a highway drainage condition survey, to improve drainage asset inventory and condition data.

9 Vehicle Restraint Systems (Crash Barriers) Performance

Crash Barriers play an important role in maintaining network safety for road users, and their failure to perform as designed can have serious implications. Medway Highways are responsible for the maintenance of 28.6km of crash barrier.

Historical practices surrounding the maintenance of crash barrier was to replace damaged sections following a road traffic collision. With crash barriers having an expected design life span of approximately 50 years, it is anticipated however that large proportions of crash barrier on Medway's network is past its expected design life. In light of this, a crash barrier survey was commissioned during 2020/21, which assessed the condition of crash barriers based on a Red/Amber/Green condition reporting with these values transposing as Poor/Fair/Good condition.

Asset Type	Total Length	Condition Banding					
		Good		Fair		Poor	
	(m)	(m)	(%)	(m)	(%)	(m)	(%)
Crash Barrier	28,598	2,025	7.1	19,914	69.6	6,659	23.3

Table 9.0 – Medway Council's Vehicle Restraint System Condition Survey Data.

The crash barrier survey data will be used towards lifecycle modelling in order to establish whether current budget provision provides the levels of investment necessary to maintain the asset to a suitable condition performance. The crash barrier network survey captured the condition of Medway's crash barrier based on a total linear meterage, as detailed within **Table 9.0** above.

Medway's crash barrier replacement programme follows a risk-based approach towards identifying sections that are to be renewed within a programme of works. Equally, any sections of barrier identified as no longer serving its function, or that provide a benefit to road safety, will also be considered for removal from the network in order to encourage decluttering, and to achieve a reduction towards ongoing maintenance costs.

9.1 Vehicle Restraint Systems Condition Forecast

9.1.1 Current Budget

The annual budget for crash barrier replacement in 2020/21 was £120,000, which is funded from the Local Transport fund (LTP) allocation.

9.1.2 Simple Replacement Frequency Calculation

The following **Table 9.1** shows the estimated cost to replace all of Medway Council's crash barrier based on the total length of barrier multiplied by the average replacement cost. Comparing this against current budget provision is currently showing that Medway's entire Crash Barrier Network will be replaced once in every 79-year cycle.

Asset Type	Total Length	Replacement Cost	Network Renewal	Expenditure (2020/21)	Renewal Frequency
	(m)	(£/m)	(£)	(£)	(years)
Crash Barrier	28,598	330	9,437,340	120,000	79

Table 9.1 - Vehicle Restraint System Budget and Renewal Frequency during 2020/21.

Ideally crash barrier should be replaced to fall in line with its design life, which is typically 50 years. The average cost to replace a meter section of crash barrier currently stands at £330 and there is currently 28,598 linear meters of highways maintainable crash barrier located on Medway Councils network, therefore:

Cost to replace entire crash barrier network = £9.5 million
Crash Barrier Design Lifespan (50 years) = £190,000 per year

This shows that the current budget provision of £120,000 is not sufficient in maintaining Medway's crash barrier within the required design life. This simple replacement frequency calculation however doesn't allow for barrier replacement cost increases over the long-term.

Highways Vehicle Restraint System Asset	Current Budget	Required Budget	Budget Shortfall
	(£'000)	(£'000)	(£'000)
All Highway Crash Barrier	120	190	70

Table 9.2 – Crash Barrier Lifecycle Modelling Budget Shortfall.

9.2 Vehicle Restraint System Summary

Following the crash barrier survey, approximately £60,000 of immediate safety repair works were completed as part of the annual crash barrier maintenance programme. Focused investment is still necessary to address the backlog of deteriorated crash barrier however, which includes the requirement to replace out of specification terminals that may otherwise present an ongoing safety risk. In an attempt to address any crash barrier deemed an ongoing risk, an additional £350,000 was submitted through Medway's Capital Strategy for financial years 2022/23 and 2023/24. Then on after an additional investment of £70,000 over base budget is required to replace crash barrier within its specified design life.

10 Summary

10.1 Current Condition and Forecast Deterioration

This Lifecycle Report has been written in the context of evaluating Medway Council's Highway Assets to determine whether current budget provisions, (2020/21 figures), are enough to sustain the Highway Infrastructure Assets without a reduction in performance.

From the Lifecycle Modelling undertaken, it can be seen that some asset groups are performing well under current investment levels. For instance, the Principal Road Network is performing well due to the historical focused investment into major routes as part of the annual carriageway maintenance programme. Even Highway Structures can sustain their level of performance in the short term without requiring additional investment.

The problem with focusing on short term planning however is that it typically provides little improvement towards performance against current investment. This is because when an asset approaches the end of its lifecycle, there is usually a rapid increase in the deterioration rate, which consequentially results in a much more severe and costly maintenance remediation. In order to address this ongoing issue, alternative methods of preventative maintenance should be considered to reduce the volumes of assets considered to be in 'Fair' condition from deteriorating into 'Poor' condition.

Lifecycle Planning has therefore identified the asset groups where investment is required to enable Medway Council to discharge its statutory duty and maintain the Highway Network in a safe condition for all network users. The outcome of this Lifecycle modelling therefore shows that Medway Highways has a budget growth requirement as detailed within **Table 2.0** to keep pace with the expected long-term renewal requirements of the Highway Network.

10.2 Lifecycle Planning Review

Due to the nature to Lifecycle Planning, undertaking a review of the HMEP Toolkits on a biennial cycle provides little to no direct benefit due to the continuously changing inventory and condition data, and highway investment levels. It is therefore proposed that the next Highway Lifecycle Planning report will take place is on a four-year rolling cycle with the next review date due in 2024/25.

A bespoke lifecycle has not yet been developed for Medway Tunnel, due to the one-off capital investment from the DfT Challenge Fund Scheme that was successfully secured in 2020/21, which would otherwise distort the lifecycle HMEP modelling. A separate lifecycle model for Medway Tunnel will therefore be developed upon completion of the Challenge Fund Scheme, in order to reflect the improvements that have been made through the scheme, and to also produce accurate modelling based on standard highway budget provision going forwards.

In addition to this, it was not possible to include Traffic Signals as part of this cycle of lifecycle planning, due to insufficient inventory and condition data surrounding this asset group. It is however the intention to develop a lifecycle for Traffic Signals as part of the next lifecycle review. In light of this, the following improvement actions have been identified within **Table 10.1** below, as part of the next lifecycle planning review cycle due in 2024/25.

Lifecycle Planning (2017/18)	Lifecycle Planning (2020/21)	Lifecycle Planning (2024/25)
Carriageways	Carriageways	Carriageways
Footways	Footways	Footways
Structures	Structures	Structures
Street Lighting	Street Lighting	Street Lighting
Drainage (Gullies only)	Drainage (Gullies only)	Drainage (All Assets)
	Crash Barriers	Crash barriers
		Traffic Signals
		Medway tunnel

Table 10.1 – Key Lifecycle Planning Highway Asset Groups to be Modelled.

11 Glossary of Terms

Acronym	Explicit Statement
BCI	Bridge Condition Index
CIPFA	Chartered Institute of Public Finance and Accountancy
CoP	Code of Practice
DfT	Department for Transport
DRC	Depreciated Replacement Cost
DMRB	Design Manual for Roads and Bridges
GIS	Geographic Information System
GRC	Gross Replacement Cost
HAMP	Highway Asset Management Plan
HMB	Highways Maintenance Block
HMEP	Highways Maintenance Efficiency Programme
ILP	Institute of Lighting Professionals
ISO	International Organization for Standardization
ITB	Integrated Transport Block
KPI	Key Performance Indicators
LGF	Local Growth Fund
LoS	Level of Service
LTP	Local Transport Plan
NHT	National Highways and Transport Public Satisfaction Survey
NI	National Indicators
SE7	South East Seven Group
SuDS	Sustainable urban Drainage Systems
TAMP	Transport Asset Management Plan
UKRLG	United Kingdom Road Liaison Group

Table 11.0 – Glossary of Terms.

Appendix 2 - Unclassified Road Network Condition Performance

Following the targeted investments made as identified within Medway Council's Lifecycle Planning Report in 2018, there has been an increased maintenance focus towards Medway's Unclassified Road Network. This is in order to address the condition performance backlog compared against the National Average performance figures that are publicised by the Department for Transport (DfT).

The following **Table 1** provides the details of all of Medway's Planned Carriageway resurfacing schemes that have been completed on Unclassified roads. This quantifies as Unclassified roads accounting for approximately two-thirds of the total planned maintenance programme year-on-year.

Financial Period	Resurfacing Schemes	Total Length Resurfaced	Total Area Resurfaced
	(No.)	(m)	(m²)
2018/19	21	4,079	32,874
2019/20	19	2,971	20,429
2020/21	23	6,739	44,041
2021/22	12	3,098	15,813

Table 1 – Annual Carriageway Resurfacing Figures for Unclassified Roads.

This focused investment has achieved an average of 1% improvement annually towards the condition performance for Medway's Unclassified Network. This is with the longer-term aim of bringing the condition of Medway's Unclassified Network to align with the National Average condition for Unclassified Roads.

The following **Table 2** below shows that in 2020/21 20% of Medway's Unclassified Road Network required maintenance, whereas the National Average is currently 16%. Without the focused investment as identified within Medway's 2018 Lifecycle Planning however, Medway's Unclassified roads would have deteriorated to approximately 24% in overall condition performance.

Percentage of Roads Requiring Maintenance	2016/17	2017/18	2018/19	2019/20	2020/21
Medway's Unclassified Road Network (Lower is better)	**14**	**20**	**23**	**21**	**20**
National Average for Unclassified Road Network	17	16	16	*	*

Table 2 – Condition Performance of the Unclassified Road Network.

* Figures for this financial period have not been publicised by the Department for Transport.

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